

s ptru/mf  
L3 1 PTRU/MF

=> d l3 ide

L3 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2007 ACS on STN  
RN 172515-31-0 REGISTRY  
ED Entered STN: 23 Jan 1996  
CN Platinum, compd. with ruthenium (1:1) (CA INDEX NAME)  
MF Pt . Ru  
AF Pt Ru  
CI TIS  
SR CA  
LC STN Files: CA, CAPLUS, CHEMCATS, TOXCENTER, USPAT2, USPATFULL

Component	Ratio	Component Registry Number
Ru	1	7440-18-8
Pt	1	7440-06-4

\*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

53 REFERENCES IN FILE CA (1907 TO DATE)  
2 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA  
53 REFERENCES IN FILE CAPLUS (1907 TO DATE)

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COST IN U.S. DOLLARS

SINCE FILE ENTRY	TOTAL SESSION
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FILE LAST UPDATED: 10 Oct 2007 (20071010/ED)

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=> s l3  
L4 53 L3

=> s 172515-31-0 or ptru  
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L6 53 L5

L7 529 PTRU  
563 L6 OR PTRU

=> s 17 and (combust or burn)  
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=> s 17 and (combust? or burn?)  
273217 COMBUST?  
189456 BURN?  
L8 2 L7 AND (COMBUST? OR BURN?)

=> dis 18 1-2 ibib iabs

L8 ANSWER 1 OF 2 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2006:66994 CAPLUS  
DOCUMENT NUMBER: 145:422298  
TITLE: Synthesis of cermet Sr(Ti,Fe)O<sub>3-δ</sub>- PtRu  
by combustion  
AUTHOR(S): Chinarro, E.; Perez, J. C.; Moreno, B.; Carrasco, M.;  
Jurado, J. R.  
CORPORATE SOURCE: Instituto de Ceramica y Vidrio, CSIC, Madrid, 28049,  
Spain  
SOURCE: NATO Science Series, II: Mathematics, Physics and  
Chemistry (2005), 202(Fuel Cell Technologies), 187-192  
CODEN: NSSICD  
PUBLISHER: Springer  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:

High sp. surface area metallic, ceramic and cermet powders may be active electrocatalyst materials, particularly for hydrocarbon oxidation in the anode compartment of a PEMFC, DMFC or SOFC. Several synthesis techniques are available for electrocatalyst preparation Sol-gel and copptn. are considered dependable methods but are time-consuming and complex. Combustion synthesis is a rapid and reliable route that allows powders of metals, ceramics and cermets free of impurities, with nanoparticle scale and high sp. surface area to be obtained. In this work, cermet material in the system SrTiFeO<sub>3-δ</sub>/ Pt-Ru was prepared for electrochem. applications by \*\*\*combustion\*\*\* synthesis. The perovskite (SrTiFeO<sub>3-δ</sub>) support for the Pt/Ru particles may decrease the Pt poisoning by CO. The Pt-Ru alloy particle size was around 15 nm. The material has been tested as anode electrocatalyst in a protonic exchange membrane fuel cell; polarization curves have been obtained with power output of 25 mW/cm<sup>2</sup>.

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L8 ANSWER 2 OF 2 CAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2005:1116583 CAPLUS

DOCUMENT NUMBER: 143:424638  
 TITLE: Method for preparing PtRu/C dual composite catalyst for cathode of alcohol fuel cell  
 INVENTOR(S): Wang, Xindong; Zhang, Hongfei; Chen, Ling; Wang, Bo  
 PATENT ASSIGNEE(S): University of Science and Technology Beijing, Peop. Rep. China  
 SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 11 pp.  
 CODEN: CNXXEV  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Chinese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1564356	A	20050112	CN 2004-10008755	20040317
PRIORITY APPLN. INFO.:			CN 2004-10008755	20040317

ABSTRACT:

This invention relates to the preparation of carbon-carrying catalyst for cathode of direct methanol fuel cell. The method comprises treating the carbon black carrier with highly basic solution containing mild reductive stannous acid to distribute the active sites uniformly on the surface of carbon black, adding high valent Ru chloroplatinate solution to reduce ruthenium ion and chloroplatinate radical and to deposit at the kinetic sites simultaneously or sequentially, and optimizing the existing state of Pt and Ru to obtain the nano \*\*\*PtRu\*\*\* /C dual composite catalyst. The catalyst has the advantages of uniform distribution of PtRu, high electro-oxidation catalytic activity for alc. under condition of low Pt content, and excellent anti-poisoning property against Co. The product can not only be used as cathode catalyst for direct methanol fuel cell, but also as cathode/anode catalyst for other fuel cell, and can be used in the fields such as gas reformation, organic substance cracking, pollutant burning, and organic substance synthesis.

=> s 17 and (reform? or fuel a4 process?)  
 52795 REFORM?  
 416991 FUEL  
 169969 FUELS  
 469623 FUEL  
 (FUEL OR FUELS)  
 13130 A4  
 4208985 PROCESS?  
 0 FUEL A4 PROCESS?  
 (FUEL(W)A4(W)PROCESS?)  
 L9 29 L7 AND (REFORM? OR FUEL A4 PROCESS?)

=> dis 19 1-29 ibib iabs

L9 ANSWER 1 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2007:830743 CAPLUS  
 TITLE: The influence of hydrogen peroxide on carbon monoxide electrooxidation at Pt/C and Pt:Ru/C electrodes  
 AUTHOR(S): Martinez, S.; Zinola, F.; Planes, G.; Guillen-Villafuerte, O.; Rodriguez, J. L.; Pastor, E.  
 CORPORATE SOURCE: Departamento de Quimica Fisica, Facultad de Quimica, Universidad de La Laguna, La Laguna, 38071, Spain  
 SOURCE: Journal of Solid State Electrochemistry (2007), 11(11), 1521-1529  
 CODEN: JSSEFS; ISSN: 1432-8488  
 PUBLISHER: Springer GmbH  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 ABSTRACT:

Polymer electrolyte fuel cells constitute one of the most important efficiency energy converters for non-centralised uses. However, the use of fuels arising from reformat processes significantly lowers the current efficiency because of anodic catalytic poison coming from adsorbed carbon monoxide (CO<sub>ad</sub>). In this work, the influence of the addition of hydrogen peroxide in the flow current is studied, considering the adsorption and electrochem. oxidation of carbon monoxide on carbon-supported Pt (20% Pt/Vulcan) and Pt:Ru (1:1, 20% Pt:Ru/Vulcan) catalysts in 2 M sulfuric acid. The investigation was conducted applying cyclic voltammetry and online differential electrochem. mass spectrometry. A series of expts. has been performed to investigate the influence of the temperature as well as the time of contact and the concentration of hydrogen peroxide. Oxidation of CO<sub>ad</sub> to carbon dioxide occurs at lower potentials in the presence of hydrogen peroxide. Moreover, it is possible to remove ca. 70% of CO<sub>ad</sub> on Pt/C electrodes. On the other hand, for PtRu/C electrodes, similar charge values to those of Pt/C electrodes were obtained for the CO stripping, but the process occurs at more neg. potentials. In this case, the effect of partial desorption for CO<sub>ad</sub> by interaction with hydrogen peroxide is added to the bifunctional mechanism usually considered for this alloy.

L9 ANSWER 2 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2007:764397 CAPLUS

DOCUMENT NUMBER: 147:346920

TITLE: Kinetics of CO Poisoning in Simulated  
Reformat and Effect of Ru Island Morphology  
on PtRu Fuel Cell Catalysts As Determined by  
Operando X-ray Absorption Near Edge Spectroscopy  
AUTHOR(S): Scott, Frances J.; Roth, Christina; Ramaker, David E.  
CORPORATE SOURCE: Department of Chemistry, The George Washington  
University, Washington, DC, 20052, USA  
SOURCE: Journal of Physical Chemistry C (2007), 111(30),  
11403-11413

CODEN: JPCCCK; ISSN: 1932-7447

PUBLISHER: American Chemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

In situ x-ray absorption spectroscopy (XAS) measurements, including both x-ray absorption near edge spectroscopy (XANES) and extended x-ray absorption fine structure (EXAFS), were carried out on com. produced Pt and PtRu bimetallic electrocatalysts as well as on a mech. mixed PtRu bimetallic electrocatalyst in an operating fuel cell in H<sub>2</sub> doped with 150 ppm CO. Using the novel  $\Delta$ XANES technique, the coverages of CO and ontop and n-fold H (overpotential deposited and underpotential deposited hydrogen) are obtained and compared for the three catalysts, and the results are correlated with PtRu cluster morphol. The mech. mixing process used to create the bimetallic PtRu catalyst is found to maximize CO tolerance, although the PtRu com. electrocatalyst exhibits an increased electronic effect, most probably due to the presence of Ru(O)<sub>x</sub> islands at the catalyst surface. The mobility of the CO on both Ru and Pt is sharply dependent on the CO coverage, decreasing dramatically beyond 0.4 fractional coverage.

REFERENCE COUNT: 65 THERE ARE 65 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 3 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2007:313732 CAPLUS

TITLE: PtMo catalysts for ultra high CO PEMFC applications

AUTHOR(S): Ball, S.; Theobald, B.; Thompsett, D.

CORPORATE SOURCE: Johnson Matthey Technology Centre, Reading, RG4 9NH,  
UK

SOURCE: Proceedings - Electrochemical Society (2006),

2004-21(Proton Conducting Membrane Fuel Cells IV),  
206-212

CODEN: PESODO; ISSN: 0161-6374

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

PtMo materials have been found to show tolerance to much higher CO levels (.apprx.0.5%CO) than conventional Pt and PtRu anode catalysts. However, PtMo is less tolerant than PtRu to the CO<sub>2</sub> which is also present in reformat gas. Optimized PtMo/C catalysts were formulated into PtMo/PtRu bilayer anodes and tested on high CO reformat mixts. equivalent to the output of a reformer and single Water Gas Shift Reactor; the use of a bilayer mitigates the effects of CO<sub>2</sub> poisoning. The mechanism via which PtMo achieves CO tolerance was found to be electrochem. driven Water Gas Shift. Results of MEA testing demonstrate good performance using 5000ppmCO (0.5%CO) reformat without air bleed. This opens up the possibilities of reducing system size and complexity, by decreasing the number of CO clean up reactors required between the fuel reformer and the anode of the fuel cell stack.

REFERENCE COUNT: 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 4 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2007:154676 CAPLUS

DOCUMENT NUMBER: 147:280669

TITLE: Performance of a miniaturized silicon reformer  
-PrOx-fuel cell system

AUTHOR(S): Kwon, Oh Joong; Hwang, Sun-Mi; Chae, Je Hyun; Kang,  
Moo Seong; Kim, Jae Jeong

CORPORATE SOURCE: Research Center for Energy Conversion and Storage,  
School of Chemical and Biological Engineering, Seoul  
National University, Seoul, Kwanak-gu, 151-742, S.  
Korea

SOURCE: Journal of Power Sources (2007), 165(1), 342-346  
CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

A fuel cell made with Si is operated with H<sub>2</sub> supplied by a reformer and a preferential oxidation (PrOx) reactor, also made of Si. The performance and durability of the fuel cell is analyzed and tested, then compared with the results obtained with pure H<sub>2</sub>. Three components of the system were made by using Si technol. and micro electro-mech. system (MEMS) technol. The com. Cu-ZnO-Al<sub>2</sub>O<sub>3</sub> catalyst for the reformer and the Pt-Al<sub>2</sub>O<sub>3</sub> catalyst for the PrOx reactor are coated by a fill-and-dry method. A conventional membrane electrode assembly composed of a 0.375 mg/cm<sup>2</sup> PtRu/C catalyst for the anode, a 0.4 mg/cm<sup>2</sup> Pt/C catalyst for the cathode, and a Nafion 112 membrane were used in the fuel cell. The reformer gives a 27. cm<sup>3</sup>/min gas production rate with 3177 ppm CO at a 1. cm<sup>3</sup>/h MeOH feed rate. The PrOx reactor shows almost 100% CO conversion under the exptl. conditions. Fuel cells operated with this fuel-processing system produce 230 mW/cm<sup>2</sup> at 0.6 V, which is similar to that obtained with pure H<sub>2</sub>.

REFERENCE COUNT: 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 5 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:1018228 CAPLUS

DOCUMENT NUMBER: 146:10551

TITLE: Comparative study of carbon-supported Pt/Mo-oxide and  
PtRu for use as CO-tolerant anode catalysts

AUTHOR(S): Ioroi, Tsutomu; Akita, Tomoki; Yamazaki, Shin-ichi;  
Siroma, Zyun; Fujiwara, Naoko; Yasuda, Kazuaki  
CORPORATE SOURCE: Research Institute for Ubiquitous Energy Devices,  
National Institute of Advanced Industrial Science and  
Technology (AIST), 1-8-31 Midoriga-oka, Ikeda, Osaka,  
563-8577, Japan  
SOURCE: Electrochimica Acta (2006), 52(2), 491-498  
CODEN: ELCAAV; ISSN: 0013-4686  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:  
C-supported Pt/Mo-oxide catalysts were prepared, and the reformat  
tolerances of Pt/MoOx/C and conventional PtRu/C anodes were examined to  
clarify the features and differences between these catalysts. Fuel cell  
performance was evaluated under various reformat compns. and  
operating conditions, and the CO concns. at the anode outlet were analyzed  
simultaneously using online gas chromatog. Pt/MoOx showed better CO tolerance  
than PtRu with CO(80 ppm)/H2 mixts., especially at higher fuel use, which  
is mainly due to the higher catalytic activity of Pt/MoOx for the WGS reaction  
and electrooxidn. of CO. But the CO2 tolerance of Pt/MoOx was much worse than  
that of PtRu with a CO2(20%)/H2 mixture. The results of voltammetry  
indicated that the coverage of adsorbates generated by CO2 reduction on Pt/MoOx was  
higher than that on PtRu, and therefore, the electrooxidn. of H2 is  
partly inhibited on Pt/MoOx in the presence of 20% CO2. With CO(80  
ppm)/CO2(20%)/H2, the voltage losses of Pt/MoOx and PtRu are almost  
equal to the sum of the losses with each contaminant component. Although the  
adsorbate coverage on Pt/MoOx increases in the presence of 20% CO2, CO mols. in  
the gas phase could still adsorb on Pt through an adsorbate "hole" to promote  
WGS or electrooxidn. reactions, which leads to a reduction in the CO concentration  
under  
CO/CO2/H2 feeding conditions.

REFERENCE COUNT: 33 THERE ARE 33 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 6 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:871976 CAPLUS  
DOCUMENT NUMBER: 146:361907  
TITLE: On the role of reactant transport and (surface) alloy  
formation for the CO tolerance of carbon supported  
PtRu polymer electrolyte fuel cell catalysts  
AUTHOR(S): Kaiser, J.; Colmenares, L.; Jusys, Z.; Moertel, R.;  
Boennemann, H.; Koehl, G.; Modrow, H.; Hormes, J.;  
Behm, R. J.  
CORPORATE SOURCE: Abt. Oberflaechenchemie und Katalyse, Universitaet  
Ulm, Ulm, D-89069, Germany  
SOURCE: Fuel Cells (Weinheim, Germany) (2006), 6(3-4), 190-202  
CODEN: FUCEFK; ISSN: 1615-6846  
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:  
The effect of atomic scale intermixing on the electrocatalytic activity of  
bimetallic PtRu anode catalysts in reformat operated  
polymer electrolyte fuel cells (PEFC) was studied, exploiting the specific  
properties of colloid-based catalyst synthesis for the selective preparation of  
alloyed and non-alloyed bimetallic catalysts. Three different C supported  
\*\*\*PtRu\*\*\* catalysts with different degrees of Pt and Ru intermixing,  
consisting of (a) C supported PtRu alloy particles (PtRu  
/C), (b) Pt and Ru particles co-deposited on the same C support (Pt+Ru/C), and  
(c) a mixture of C supported Pt and C supported Ru (Pt/C+Ru/C) as well as the  
resp. monometallic Pt/C and Ru/C catalysts were prepared and characterized by  
TEM, XAS and CO stripping. Their performance as PEFC anode catalysts was

evaluated by oxidation of a H<sub>2</sub>/2%CO gas mixture (simulated reformat) under fuel cell-relevant conditions (elevated temperature, continuous reaction and controlled reactant transport) in a rotating disk electrode set-up. The CO tolerance and H<sub>2</sub> oxidation activity of the 3 catalysts is comparable and distinctly different from that of the monometallic catalysts. The results indicate significant transport of the reactants, CO<sub>ad</sub> and/or OH<sub>ad</sub>, between Pt and Ru surface areas and particles for all 3 catalysts, with only subtle differences from the alloy catalyst to the phys. mixture. The high activity and CO tolerance of the bimetallic catalysts, through the formation of bimetallic surfaces, is explained, e.g., by contact formation in nanoparticle agglomerates or by material transport and subsequent surface decoration/surface alloy formation during catalyst prepn., conditioning, and operation. The instability and mobility of the catalysts under these conditions closely resembles concepts in gas phase catalysis.

REFERENCE COUNT: 73 THERE ARE 73 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 7 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:1116583 CAPLUS

DOCUMENT NUMBER: 143:424638

TITLE: Method for preparing PtRu/C dual composite catalyst for cathode of alcohol fuel cell

INVENTOR(S): Wang, Xindong; Zhang, Hongfei; Chen, Ling; Wang, Bo  
PATENT ASSIGNEE(S): University of Science and Technology Beijing, Peop. Rep. China

SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 11 pp.  
CODEN: CNXXEV

DOCUMENT TYPE: Patent  
LANGUAGE: Chinese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
-----	---	-----	-----	-----
CN 1564356	A	20050112	CN 2004-10008755	20040317
PRIORITY APPLN. INFO.:			CN 2004-10008755	20040317

ABSTRACT:

This invention relates to the preparation of carbon-carrying catalyst for cathode of direct methanol fuel cell. The method comprises treating the carbon black carrier with highly basic solution containing mild reductive stannous acid to distribute the active sites uniformly on the surface of carbon black, adding high valent Ru chloroplatinate solution to reduce ruthenium ion and chloroplatinate radical and to deposit at the kinetic sites simultaneously or sequentially, and optimizing the existing state of Pt and Ru to obtain the nano \*\*\*PtRu\*\*\* /C dual composite catalyst. The catalyst has the advantages of uniform distribution of PtRu, high electro-oxidation catalytic activity for alc. under condition of low Pt content, and excellent anti-poisoning property against Co. The product can not only be used as cathode catalyst for direct methanol fuel cell, but also as cathode/anode catalyst for other fuel cell, and can be used in the fields such as gas reformation, organic substance cracking, pollutant burning, and organic substance synthesis.

L9 ANSWER 8 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:599565 CAPLUS

DOCUMENT NUMBER: 143:269545

TITLE: Electrochemical preferential oxidation of CO in reformat

AUTHOR(S): Zhang, Jingxin; Datta, Ravindra  
CORPORATE SOURCE: Fuel Cell Center, Department of Chemical Engineering, Worcester Polytechnic Institute, Worcester, MA, 01609, USA

SOURCE: Journal of the Electrochemical Society (2005), 152(6),

A1180-A1187

CODEN: JESOAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

An electrochem. preferential oxidation (ECPrOx) process, an alternative to the conventional preferential oxidation (PrOx), was developed to remove CO from a H-rich gas mixture using a device similar in structure to a p exchange membrane fuel cell. In this process, selective CO electrooxidn. is achieved at the anode by rendering the process electrochem. and by autonomous anode potential oscillations when operated at a constant low c.d. The oscillation period and amplitude of the ECPrOx device adjust automatically to the CO levels in the feed stream so that a self-controlled autonomous potential pulsing is achieved with a low level of CO in the cleansed reformat. Some supplemental elec. power is produced from the ECPrOx device while CO is removed from the \*\*\*reformat\*\*\* gas, without any H<sub>2</sub> or CO being wasted. The ECPrOx device can be operated at room temperature, high anode pressure, atmospheric air pressure, and without external humidification. The operating conditions and structure of the ECPrOx were not optimized but the feasibility of the concept was evaluated with a single cell.

REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 9 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:521285 CAPLUS

DOCUMENT NUMBER: 143:289296

TITLE: Evaluation of the water-gas shift and CO methanation processes for purification of reformat gases and the coupling to a PEM fuel cell system

AUTHOR(S): Batista, Marcelo S.; Santiago, Elisabete I.; Assaf, Elisabete M.; Ticianelli, Edson A.

CORPORATE SOURCE: Instituto de Quimica de Sao Carlos, USP, Sao Carlos, SP, 13560-970, Brazil

SOURCE: Journal of Power Sources (2005), 145(1), 50-54

CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

The H<sub>2</sub>O-gas shift (WGS) and the CO methanation reactions on a Co/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst and the coupling of these reactors to a p exchange membrane fuel cell were studied. Chromatog. analyses showed that when the reactors are fed with a H<sub>2</sub>/CO (1000 ppm) mixture, conversion of CO into methane (90%) or CO<sub>2</sub> (83%) occurs for the methanation and WGS processes, resp. These reactions are influenced by the presence of CO<sub>2</sub>, particularly in the absence of H<sub>2</sub>O, for which the methanation of CO<sub>2</sub> is observed. In both cases, some production of CO is also apparent.

Fuel cell polarization data showed a decrease in the CO poisoning effect for fuel cells with a PtRu/C anode fed with a H<sub>2</sub>/CO (1000 ppm) mixture after coupling with the methanation or the WGS reactors. In agreement with chromatog. analyses, better fuel cell efficiency was observed with the methanation reactor.

REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 10 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:166752 CAPLUS

DOCUMENT NUMBER: 142:381104

TITLE: Oxygen reduction reaction on Pt and Pt-bimetallic electrodes covered by CO: mechanism of the air bleed



effect with reformat  
AUTHOR(S): Stamenkovic, V.; Grgur, B. N.; Ross, P. N.; Markovic, N. M.  
CORPORATE SOURCE: Lawrence Berkeley National Laboratory, Materials Sciences Division, University of California, Berkeley, CA, 94720, USA  
SOURCE: Journal of the Electrochemical Society (2005), 152(2), A277-A282  
CODEN: JESOAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:

The oxygen reduction reaction (ORR) was studied on CO-covered Pt(111), Pt(110), Pt-poly, Pt-Ru, Pt3Sn(111), and Pt3Sn(110) electrodes in 0.5M H2SO4 solution at temps. varying between 298 and 333 K using the rotating ring-disk electrode (RRDE) method. The RRDE measurements showed that even during O2 reduction a substantial amount ( $\approx 40\%$  of saturation) of CO still remains on all surfaces. Only a very small fraction of consumed O2 is used for CO oxidation, while the major fraction reacts via the competing ORR, producing H2O2. The H2O2 yield is strongly dependent on the fractional coverage by adsorbed CO, the surface structure, and the composition of the electrode. While at  $\theta_{CO} > 0.5$  monolayer (ML) the H2O2 yield is very high (depending on the structure/nature of the electrode  $\approx 60-100\%$ ), when  $\theta_{CO}$  falls to its steady-state value of  $\approx 0.4$  ML, the H2O2 yield is almost the same as on the resp. CO-free surfaces. Although the production of peroxide on some electrodes is rather low at 333 K (e.g., 5% on PtRu and 10% on Pt-poly), the practical consequences of the H2O2 production can be significant; e.g., H2O2 may cause an enhanced long-term degradation of the membrane.

REFERENCE COUNT: 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 11 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:106424 CAPLUS  
DOCUMENT NUMBER: 142:357909  
TITLE: Quantifying the 'reverse water gas shift' reaction inside a PEM fuel cell  
AUTHOR(S): Gu, Tao; Lee, W.-K.; Van Zee, J. W.  
CORPORATE SOURCE: Department of Chemical Engineering, University of South Carolina, Columbia, SC, 29208, USA  
SOURCE: Applied Catalysis, B: Environmental (2005), 56(1-2), 43-50  
CODEN: ACBEE3; ISSN: 0926-3373  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:

Reformed gas containing CO2, N2, and H2 may be used in proton exchange membrane fuel cells (PEMFCs), and recent evidence showed that CO2 can react in situ with H2 (i.e., a reverse water gas shift (RWGS) reaction) and produce adsorbed CO that can poison the electrode catalyst. Here, a study is presented to extend the previous observations by considering how pressure, gas composition, and temperature affect this reaction in a PEMFC for both Pt and Pt/Ru alloy catalysts. The coverage of CO produced on the electrodes was determined by stripping cyclic voltammetry (CV). The data show how the CO stripping potential depends on temperature, and how the anal. allows the determination of an activation energy. The data are consistent with a kinetic catalytic model and not with an equilibrium model.

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 12 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:103201 CAPLUS  
DOCUMENT NUMBER: 143:45978  
TITLE: Current status in investigation of electrocatalysts  
for low temperature fuel cell  
AUTHOR(S): Yu, Shou-geng  
CORPORATE SOURCE: Kunming Institute of Precious Metals, Kunming Yunnan,  
650221, Peop. Rep. China  
SOURCE: Dianyuan Jishu (2004), 28(12), 798-802  
CODEN: DIJIFT; ISSN: 1002-087X  
PUBLISHER: Dianyuan Jishu Bianjibu  
DOCUMENT TYPE: Journal; General Review  
LANGUAGE: Chinese  
ABSTRACT:

Two of the most advanced low temperature fuel cells are the proton exchange membrane fuel cell (PEMFC) and the direct methanol fuel cell (DMFC). The recent advances in the electrocatalysts of their anode and cathode were summarized in this paper, involving that in PEMFC, PtCr in the cathode when using pure H<sub>2</sub> as fuel and CO-tolerant PtRu and PtRu/WOX in the anode when using the reformat as fuel; in DMFC, methanol electro-oxidation accelerating PtRu, PtRuOs, PtRuNi, and a mixture of Pt tetramine complex with Co quinolyldiamine complex in the anode, carbon-supported Pt and Co/Fe-porphyrin in the cathode, concerning that bifunctional mechanism, intermediate mechanism, methanol electro-oxidation process within PtRu anode, and side on electrocatalysis mechanism of O<sub>2</sub> reduction in Co/Fe-porphyrin nano-structure. A direct 2-propanol fuel cell with Ni as an anodic electrocatalyst is expected as a new power source for mobile applications.

L9 ANSWER 13 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2004:974281 CAPLUS  
DOCUMENT NUMBER: 142:159281  
TITLE: Effect of Reformate Components on PEMFC  
Performance  
AUTHOR(S): Gu, Tao; Lee, W.-K.; Van Zee, J. W.; Murthy, M.  
CORPORATE SOURCE: Department of Chemical Engineering, University of  
South Carolina, Columbia, SC, 29208, USA  
SOURCE: Journal of the Electrochemical Society (2004),  
151(12), A2100-A2105  
CODEN: JESQAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:

Data are presented to quantify the effect of reformat components on the performance of proton exchange membrane fuel cells (PEMFCs) with Pt and Pt/Ru alloy anodes. The performance deviates by 10-70 mV from Nernst behavior at current densities >0.3 A/cm<sup>2</sup> when the cell is operated with N<sub>2</sub>/H<sub>2</sub> mixts. The same deviations were observed with CO<sub>2</sub>/H<sub>2</sub> mixts. for a PEMFC with a Pt/Ru anode. However, for a PEMFC with a Pt anode, CO<sub>2</sub>-diluted H<sub>2</sub> gives significantly larger polarizations than N<sub>2</sub>-diluted H<sub>2</sub>. Also, cyclic voltammetry indicates that, after the anode is exposed to the CO<sub>2</sub>/H<sub>2</sub> mixture, some CO is produced through the reverse water gas shift (RWGS) reaction. These data are consistent with equilibrium calcs. showing that the CO concentration can reach between 10 to 170 ppm.

Consistent with CO production from CO<sub>2</sub>, the CO stripping areas (which are a measure of CO coverage) also showed dependence on the inlet composition of the anode gas as well as the presence of O<sub>2</sub> on the cathode side. The CO coverage resulting from the RWGS reaction approaches 5 × 10<sup>-7</sup> mol/cm<sup>2</sup> for a 0.4 mg/cm<sup>2</sup> Pt anode.

REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 14 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2004:586043 CAPLUS  
DOCUMENT NUMBER: 141:263333  
TITLE: Electrocatalysis of CO tolerance by carbon-supported PtMo electrocatalysts in PEMFCs  
AUTHOR(S): Mukerjee, S.; Urian, R. C.; Lee, S. J.; Ticianelli, E. A.; McBreen, J.  
CORPORATE SOURCE: Department of Chemistry, Northeastern University, Boston, MA, 02115, USA  
SOURCE: Journal of the Electrochemical Society (2004), 151(7), A1094-A1103  
CODEN: JESOAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:

This paper is a full version of an earlier short communication, where significantly higher (up to 3-fold) CO tolerance was reported for PtMo/C (atomic ratio, Pt:Mo, 3:1) relative to the current state-of-the-art PtRu/C (1:1) in a p exchange membrane fuel cell (PEMFC) under standard operating conditions (85°, 100% humidification, with H<sub>2</sub> + 100 ppm CO/O<sub>2</sub>). The behavior of PtMo/C differs significantly from that of PtRu/C - there is negligible variation in CO tolerance (100 ppm CO in H<sub>2</sub>) with variation in alloying compns. for Pt:Mo = 1:1 to 5:1. In contrast to Pt/C and PtRu/C there is less variation in overpotential losses for PtMo/C as a function of temperature (55-115°) and CO concns. (5-100 ppm, balance H<sub>2</sub>). Excellent long-term stability is reported for PtMo/C (1:1) under steady-state conditions (potential constant at 0.6 V) for 1500 h, but with anode gas composition varied between pure H<sub>2</sub> and H<sub>2</sub> with 100 ppm CO, with and without other \*\*\*reformate\*\*\* gases (CO<sub>2</sub> and N<sub>2</sub>). These properties are discussed with reference to physicochem. characterization of the nanoparticles with XRD, TEM, and in situ synchrotron x-ray absorption spectroscopy.

REFERENCE COUNT: 51 THERE ARE 51 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 15 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2004:185783 CAPLUS  
DOCUMENT NUMBER: 140:306631  
TITLE: Dependence of PEM fuel cell performance on catalyst loading  
AUTHOR(S): Gasteiger, H. A.; Panels, J. E.; Yan, S. G.  
CORPORATE SOURCE: Fuel Cell Activities, General Motors, Honeoye Falls, NY, 14472, USA  
SOURCE: Journal of Power Sources (2004), 127(1-2), 162-171  
CODEN: JPSODZ; ISSN: 0378-7753  
PUBLISHER: Elsevier Science B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
ABSTRACT:

This study focuses on a determination of the cell voltage losses observed for Pt and \*\*\*PtRu\*\*\* loading redns. in H<sub>2</sub>/air and reformate/air polymer electrolyte membrane (PEM) fuel cells. Expts. with catalyst-coated membranes of varying anode and cathode catalyst loadings with H<sub>2</sub>/O<sub>2</sub> and H<sub>2</sub>/air demonstrate that the anode catalyst loading in state-of-the-art membrane electrode assemblies (MEAs) operating on pure H<sub>2</sub> can be reduced to 0.05 mg Pt/cm<sup>2</sup> without significant voltage losses, while the cell voltage losses upon a reduction of the cathode catalyst loading from 0.40 to 0.20 mg Pt/cm<sup>2</sup> for optimized MEAs amts. to 10-20 mV, consistent with purely kinetic losses due to the oxygen reduction reaction. It is shown that H<sub>2</sub>/air operation with state-of-the-art MEAs very closely approaches the Pt-specific power d. (in units of g of Pt/kW) for large-scale automotive fuel cell applications with pure H<sub>2</sub> feed. For \*\*\*reformate\*\*\* /air operation, PtRu anode loadings can be reduced to 0.20 mg PtRu/cm<sup>2</sup> for reformate containing 100 ppm CO with a 2% air-bleed. Any further reduction will, however, require either a change in

operating conditions (i.e., lower CO concentration or cell temperature »80°) or novel, more CO-tolerant anode catalysts.

REFERENCE COUNT: 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 16 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:739189 CAPLUS

DOCUMENT NUMBER: 140:184545

TITLE: Electrocatalysis of reformat tolerance in proton exchange membranes fuel cells: Part I

AUTHOR(S): Urian, Richard C.; Gulla, Andrea F.; Mukerjee, Sanjeev

CORPORATE SOURCE: Department of Chemistry, Northeastern University, Boston, MA, 02115, USA

SOURCE: Journal of Electroanalytical Chemistry (2003), 554-555, 307-324

CODEN: JECHES

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

The anode tolerance resulting from the presence of both CO and CO<sub>2</sub> in the \*\*\*reformat\*\*\* feed gas to proton-exchange-membrane fuel cells (PEMFCs) was investigated for carbon-supported Pt, Pt-Ru (1:1), and carbon-supported Pt-Mo (1:1, 3:1, 4:1, and 5:1) electrocatalysts at various levels of CO and CO<sub>2</sub> in H<sub>2</sub>. The results were used to explain results obtained with a fixed \*\*\*reformat\*\*\* composition: 45% H<sub>2</sub>, 10 ppm CO, 15% CO<sub>2</sub>, 1% CH<sub>4</sub> (balanced N<sub>2</sub>). Results with CO in H<sub>2</sub> showed that PtMo/C exhibited at least a three-fold better CO tolerance, compared with PtRu/C and four-fold with respect to Pt/C. The variation of PtMo at. compn. has a negligible effect on CO tolerance. Addnl. surface poisoning was detected for all the electrocatalysts studied in the 40-60:40-60 H<sub>2</sub>-CO<sub>2</sub> molar ratio. The presence of a reduced CO<sub>2</sub> species was confirmed using cyclic voltammetry. An ensemble effect was proposed to explain the variation of tolerance to CO<sub>2</sub> as a function of Pt:Mo at. ratio, which is in contrast to the effect in the presence of adsorbed CO. The overpotential losses in the presence of H:CO<sub>2</sub> for PtMo/C (1:1) and \*\*\*PtRu\*\*\* /C (1:1) were very close. With increasing Pt content of the PtMo/C catalysts, the overpotential losses followed those obsd. for pure Pt, which clearly demonstrated a relationship between overpotential loss and Pt site availability. Despite similar overpotential losses between Pt/C and PtMo/C (5:1), both of which were greater than that of PtRu/C (1:1), the overpotential loss obsd. for PtMo in a CO<sub>2</sub>+CO reformat mix was far better than for both PtRu/C and Pt/C.

REFERENCE COUNT: 46 THERE ARE 46 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 17 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:647680 CAPLUS

DOCUMENT NUMBER: 139:342188

TITLE: Hydrogen adsorption and coadsorption with CO on well-defined bimetallic PtRu surfaces--a model study on the CO tolerance of bimetallic PtRu anode catalysts in low temperature polymer electrolyte fuel cells

AUTHOR(S): Diemant, T.; Hager, T.; Hoster, H. E.; Rauscher, H.; Behm, R. J.

CORPORATE SOURCE: Abteilung Oberflächenchemie und Katalyse, Universität Ulm, Ulm, D-89069, Germany

SOURCE: Surface Science (2003), 541(1-3), 137-146

CODEN: SUSCAS; ISSN: 0039-6028

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

The influence of PtRu surface alloy formation and of coadsorbed CO on the adsorption/desorption characteristics of hydrogen on bimetallic \*\*\*PtRu\*\*\* surfaces was investigated by temperature programmed desorption, using a 40% Pt containing PtRu surface alloy pseudomorphic on a Ru(0 0 0 1) surface with an almost statistical distribution of Pt surface atoms as substrate. Alloy formation leads to a significant broadening of the desorption peak compared to pure Ru, together with a considerable down-shift in the onset of desorption. This trend is even more pronounced in the presence of coadsorbed CO. The weakening of the hydrogen adsorption bond is attributed mainly to strain effects, imposed by the considerable compression of the pseudomorphic Pt as compared to bulk Pt(1 1 1). Finally we discuss the implications of these results for the mechanistic understanding of the improved performance of PtRu anode catalysts in reformat operated polymer electrolyte fuel cells.

REFERENCE COUNT: 42 THERE ARE 42 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 18 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:389070 CAPLUS

DOCUMENT NUMBER: 139:103656

TITLE: Ultra CO tolerant PtMo/PtRu anodes for PEMFCs

AUTHOR(S): Ball, Sarah C.; Thompsett, David

CORPORATE SOURCE: Johnson Matthey Technology Centre, Reading, RG4 9NH, UK

SOURCE: Materials Research Society Symposium Proceedings (2003), 756(Solid State Ionics--2002), 353-364  
CODEN: MRSPDH; ISSN: 0272-9172

PUBLISHER: Materials Research Society

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

Progress has been made in designing an anode electrode that can tolerate CO levels of several thousand ppm which are a typical output of a fuel processor consisting of a reformer and water-gas-shift unit only. The combination of a PtMo catalyst that is capable of electrochem. oxidizing CO and a PtRu catalyst that can tolerate high levels of CO<sub>2</sub> arranged in a bilayer configuration, has been shown to tolerate 2000 ppm CO in H<sub>2</sub> with a relatively small loss in fuel cell performance. Further improvements in the ability to tolerate higher levels of CO with lower performance losses are expected due to improved PtMo catalyst design.

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 19 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:100746 CAPLUS

DOCUMENT NUMBER: 138:341015

TITLE: Electrocatalysts for proton exchange membrane fuel cells in Dalian Institute of Chemical Physics, Chinese Academy of Sciences study - on the CO tolerance

AUTHOR(S): Yi, Baolian; Yu, Hongmei; Hou, Zhongjun; Lin, Zhiyin; Zhang, Jinxin; Ming, Pingwen; Zhang, Huamin

CORPORATE SOURCE: Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, Lianning, 116023, Peop. Rep. China

SOURCE: Guijinshu (2002), 23(4), 14-20  
CODEN: GUIJE7; ISSN: 1004-0676

PUBLISHER: Guijinshu Jikan Bianjibu

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

CO tolerant electrocatalysts of PtRu/C and PtRu-HxWOy/C were prep'd. and characterized. A composite support method was applied to prep. \*\*\*PtRu\*\*\* -HxWOy/C. The performances of cell made of the CO tolerance catalysts were much higher than that of Pt/C when CO contg. fuel was applied. A composite structure electrode was developed, and showed good CO tolerance. At last a 5-kW PEMFC stack equipped with the composite structure electrodes was operated with methanol reforming fuel, and showed good performance.

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 20 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:674544 CAPLUS

DOCUMENT NUMBER: 138:6403

TITLE: Dynamic and steady-state methods for evaluation of CO-tolerant electrocatalysts and membrane-electrode-assemblies

AUTHOR(S): Starz, K. A.; Koehler, J.; Ruth, K.; Sextl, G.; Vogt, M.

CORPORATE SOURCE: OM Group, Business Unit Fuel Cells, Hanau-Wolfgang, D-63403, Germany

SOURCE: Fuel Cells (Weinheim, Germany) (2002), 2(1), 20-24  
CODEN: FUCEFK; ISSN: 1615-6846

PUBLISHER: Wiley-VCH Verlag GmbH

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

The operation of PEMFC stacks with impure hydrogen generated from \*\*\*reforming\*\*\* processes based on hydrocarbon fuels is associated with problems due to poisoning of the Pt based anode catalyst by carbon monoxide (CO). In order to address these problems, advanced CO tolerant PtRu electrocatalysts and MEAs have been developed by OMG over the past years. In the course of this work, specific testing and evaluation methods for these products were established and implemented. During operation of PEMFC systems in vehicles and busses, transient exposure of the anode catalyst with high levels of CO can occur. To simulate these conditions in a lab environment, dynamic testing procedures simulating transient CO poisoning conditions were developed. For stationary PEMFC systems running on CO containing natural gas (NG) \*\*\*reformate\*\*\*, besides the production costs, endurance, stability and lifetime of MEAs are of primary importance. For this application field, the "CO-gain" diagnostic method was developed. This in-situ method allows to generate data and information on anode catalyst performance while performing a continuous, non-interrupted lifetime testing of the MEA. This paper describes the dynamic and steady-state testing methods developed and employed at OMG to evaluate CO tolerant electrocatalysts and membrane-electrode-assemblies (MEAs). For illustration, typical performance data obtained with the new testing procedures and methods are presented.

REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 21 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:178500 CAPLUS

DOCUMENT NUMBER: 137:96179

TITLE: Composite anode for CO tolerance proton exchange membrane fuel cells

AUTHOR(S): Yu, Hongmei; Hou, Zhongjun; Yi, Baolian; Lin, Zhiyin  
CORPORATE SOURCE: Dalian Institute of Chemical Physics, Fuel Cell R&D Center, Chinese Academy of Sciences, Dalian, 116023, Peop. Rep. China

SOURCE: Journal of Power Sources (2002), 105(1), 52-57

CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

Fuel of proton exchange membrane fuel cells mostly comes from reformat containing CO, which will poison the fuel cell electrocatalyst. The effect of CO on the performance of proton exchange membrane fuel cells is studied. Several electrode structures are investigated for CO-containing fuel. The exptl. results show that thin-film catalyst electrode has higher specific catalyst activity and traditional electrode structure can stand for CO poisoning to some extent. A composite electrode structure is proposed for improving CO tolerance of proton exchange membrane fuel cells. With the same catalyst loading, the new composite electrode has improved cell performance compared to traditional electrode with PtRu/C electrocatalyst for both pure hydrogen and CO/H<sub>2</sub>. The EDX test of composite anode is also performed and the effective catalyst distribution is found for the composite anode.

REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 22 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:136380 CAPLUS

DOCUMENT NUMBER: 136:388346

TITLE: Examining a potential fuel cell poison a voltammetry study of the influence of carbon dioxide on the hydrogen oxidation capability of carbon-supported Pt and PtRu anodes

AUTHOR(S): Papageorgopoulos, Dimitrios C.; De Bruijn, Frank A.  
CORPORATE SOURCE: Department of Clean Fossil Fuels, Netherlands Energy Research Foundation ECN, Petten, 1755 ZG, Neth.

SOURCE: Journal of the Electrochemical Society (2002), 149(2), A140-A145

CODEN: JESOAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

Polymer electrolyte fuel cells being operated on reformed fossil fuels are exposed to large quantities of carbon dioxide. In order to elucidate the extent of the reverse water gas shift of CO<sub>2</sub> on hydrogen-covered fuel-cell anodes to CO, an extensive cyclic voltammetry study has been done on Pt and \*\*\*PtRu\*\*\* electrodes in sulfuric acid with varying hydrogen coverage. The electrodes used are representative of those being used in proton exchange membrane fuel cells. The reverse shift reaction is facile on Pt/C, but with the surface not poisoned to the same extent as it does by exposure to CO-saturated solns. The reaction product is oxidized in a similar fashion to formic acid and methanol on platinum. The results indicate the formation of a stable adlayer, consisting of linear, bridge, and multibonded CO in accordance to what has been proposed for unsupported platinum electrodes. PtRu/C fuel-cell anodes are expected to be considerably more tolerant toward carbon dioxide than Pt/C anodes, with both the reaction suppressed and the adsorbate oxidation occurring at a lower potential.

REFERENCE COUNT: 44 THERE ARE 44 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 23 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:70588 CAPLUS

DOCUMENT NUMBER: 136:372149

TITLE: The proton exchange membrane fuel cell performance of a carbon supported PtMo catalyst operating on reformat

AUTHOR(S): Ball, Sarah; Hodgkinson, Adam; Hoogers, Gregor; Maniquet, Stephanie; Thompsett, David; Wong, Ben  
CORPORATE SOURCE: Johnson Matthey Technology Centre, Reading, RG4 9NH, UK

SOURCE: Electrochemical and Solid-State Letters (2002), 5(2),  
A31-A34  
CODEN: ESLEF6; ISSN: 1099-0062  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English

ABSTRACT:

The proton exchange membrane fuel cell performance of carbon-supported Pt, \*\*\*PtRu\*\*\* and PtMo catalysts on reformat gas mixts. was investigated. The catalysts were tested as low Pt loaded electrodes in membrane electrode assemblies at 80 °C using H<sub>2</sub>; 10, 40, 100 ppm CO in H<sub>2</sub>; 25% CO<sub>2</sub> in H<sub>2</sub>. and 40 ppm CO/25% CO<sub>2</sub> in H<sub>2</sub> reformat gas mixts. as the fuel stream. The PtMo catalyst showed better CO tolerance than the \*\*\*PtRu\*\*\* catalyst at 100 ppm, but showed poorer CO<sub>2</sub> tolerance to both Pt and PtRu. With 40 ppm CO/25% CO<sub>2</sub> in H<sub>2</sub>, PtMo showed inferior overall \*\*\*reformat\*\*\* tolerance to PtRu.

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 24 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:23944 CAPLUS

DOCUMENT NUMBER: 136:297303

TITLE: Nanophase catalyst layer for direct methanol fuel cells

AUTHOR(S): Chang, Hyuk; Kim, Jirae

CORPORATE SOURCE: Materials & Devices Lab., Samsung Advanced Inst. Technology, Suwon, Kyungki-Do, Korea, S. Korea

SOURCE: Journal of the Korean Electrochemical Society (2001), 4(4), 172-175

CODEN: JKESFC; ISSN: 1229-1935

PUBLISHER: Korean Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

ABSTRACT:

Nanophase catalyst layer for direct methanol fuel cell has been fabricated by magnetron sputtering method. Catalyst metal targets and carbon were sputtered simultaneously on the Nafion membrane surface at abnormally higher gas (Ar/He mixture) pressure than that of normal thin film processing. They could be coated as a novel structure of catalyst layer containing porous PtRu or Pt and carbon particles both in nanometer range. Membrane electrode assembly made with this layer led to a reduction of the catalyst loading. At the catalyst loading of 1.5 mg PtRu/cm<sup>2</sup> for anode and 1 mg Pt/cm<sup>2</sup> for cathode, it could provide 45 mW/cm<sup>2</sup> in the operation at 2 M methanol, 1 Bar Air at 80°C. It is more than 30% increase of the power d. performance at the same level of catalyst loading by conventional method. This was realized due to the ultra fine particle sizes and a large fraction of the atoms lie on the grain boundaries of nanophase catalyst layer and they played an important role of fast catalyst reaction kinetics and more efficient fuel path. Commercialization of direct methanol fuel cell for portable electronic devices is anticipated by the further development of such design.

REFERENCE COUNT: 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L9 ANSWER 25 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2001:699122 CAPLUS

DOCUMENT NUMBER: 136:40125

TITLE: Study on performance of proton exchange membrane fuel cell with reformat fuel

AUTHOR(S): Yu, Hong-mei; Yi, Bao-lian; Bi, Ke-wan; Hou, Zhong-jun; Lin, Zhi-yin; Han, Ming

CORPORATE SOURCE: Fuel Cell R & D Center, Dalian Institute of Chemical Physics, Chinese Academy of Science, Dalian, Liaoning,



116023, Peop. Rep. China  
SOURCE: Dianyuan Jishu (2001), 25(4), 275-278  
CODEN: DIJIFT; ISSN: 1002-087X  
PUBLISHER: Dianyuan Jishu Bianjibu  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
ABSTRACT:

Proton exchange membrane fuel cell (PEMFC) is a new and clean power-generation facility with high efficiency. Traditional PEMFC consumes pure hydrogen, which is not convenient for use. Reformate is more attractive for PEMFC commercialization than pure hydrogen. The effects of each component in \*\*\*reformate\*\*\* were investigated. The results of the experiment show that CO-poisoning effect, nitrogen-diluting effect, CO<sub>2</sub>-diluting effect and the reaction balance between CO<sub>2</sub> and CO are the main factors for decreasing cell performance. The PtRu electrocatalyst is suitable for \*\*\*reformate\*\*\* fuel.

L9 ANSWER 26 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2001:525840 CAPLUS  
DOCUMENT NUMBER: 135:244910  
TITLE: Performance of proton exchange membrane fuel cell with CO/H<sub>2</sub> fuel  
AUTHOR(S): Yu, Hong-mei; Hou, Zhong-jun; Yi, Bao-lian; Bi, Ke-wan; Zhang, Jing-xin; Lin, Zhi-yin; Han, Ming  
CORPORATE SOURCE: Fuel Cell R& D Center, Dalian Institute of Chemical Physics, Chinese Academy of Science, Dalian, 116023, Peop. Rep. China

SOURCE: Dianhuaxue (2001), 7(2), 238-243  
CODEN: DIANFX; ISSN: 1006-3471  
PUBLISHER: Dianhuaxue Bianjibu  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
ABSTRACT:

Fuel of proton exchange membrane fuel cell (PEMFC) mostly comes from \*\*\*reformate\*\*\* contains CO which will poison the fuel cell electrocatalyst. The effect of CO on the performance of PEMFC was studied in this paper. When CO is fed in PEMFC, the cell voltage will be decreased violently, then it will become steady with some vibration. The poison will become more serious with higher CO content and weaker at higher temp. The adsorption of CO on the electrocatalyst is reversible, the PtRu electrocatalyst is more suitable for the electrocatalysis of CO/H<sub>2</sub> than Pt electrocatalyst.

L9 ANSWER 27 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1999:541227 CAPLUS  
TITLE: Performance of an ambient pressure cell stack operating under synthetic gasoline reformat  
AUTHOR(S): Kocha, Shyam; Gaskins, Aaron Jr.; Plasse, Paul; Wheeler, Douglas  
CORPORATE SOURCE: Advanced Technology, International Fuel Cells, LLC, South Windsor, CT, 06074, USA  
SOURCE: Book of Abstracts, 218th ACS National Meeting, New Orleans, Aug. 22-26 (1999), FUEL-114. American Chemical Society: Washington, D. C.  
CODEN: 67ZJA5  
DOCUMENT TYPE: Conference; Meeting Abstract  
LANGUAGE: English  
ABSTRACT:

The performance of an ambient pressure full size planform based on IFC cell design at 650C is reported. The effect of fuel flow utilization and oxygen utilization was measured. The effect of dilution by N<sub>2</sub> was separated from the effect

of poisoning by CO<sub>2</sub>. The cell performance was measured under simulated synthetic reformat containing 49% H<sub>2</sub>, 21%CO<sub>2</sub>, 30%N<sub>2</sub> and 10-50ppm CO. Oscillations in cell potential at constant c.d. were observed due to the CO poisoning. It was found that air bleed eliminated the poisoning effect of CO and that air bleed requirements varied with catalyst type e.g. Pt catalyst compared to PtRu. Efficiency of the air injection will be reported based on gas chromatog. and fuel cell performance.

L9 ANSWER 28 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1997:585815 CAPLUS  
DOCUMENT NUMBER: 127:250533  
TITLE: Reformat tolerance in proton exchange  
membrane fuel cells: electrocatalyst solutions  
AUTHOR(S): Cooper, S. J.; Gunner, A. G.; Hoogers, G.; Thompsett,  
D.  
CORPORATE SOURCE: Johnson Matthey Technology Centre, Sonning Common,  
Reading, RG4 9NH, UK  
SOURCE: New Materials for Fuel Cell and Modern Battery Systems  
II, Proceedings of the International Symposium on New  
Materials for Fuel Cell and Modern Battery Systems,  
2nd, Montreal, July 6-10, 1997 (1997), 286-296.  
Editor(s): Savadogo, O.; Roberge, P. R. Ecole  
Polytechnique de Montreal: Montreal, Que.  
CODEN: 64ZAAP  
DOCUMENT TYPE: Conference  
LANGUAGE: English  
ABSTRACT:

Anode catalysts for proton exchange membrane fuel cells have been tested for CO tolerance in electrochem. half cells. By employing a variety of techniques, oxidative CO stripping, specific activity tests with 100 ppm CO/H<sub>2</sub> and with pure CO in combination with online mass spectrometry, two distinct tolerance mechanisms have been identified. It is shown that the known high CO tolerance of PtRu catalysts at practical potentials is not based on CO oxidation. In binary alloys such as PtRu, PtCo and PtRh, active site blocking by CO is reduced by modification of CO and H<sub>2</sub> chemisorption behavior. In contrast, Pt-WO<sub>3</sub> and Pt-SnO<sub>2</sub> oxide doped catalysts promote the oxidn. of CO to CO<sub>2</sub> at lower potentials than pure Pt, most likely by activation of H<sub>2</sub>O. With 100 ppm CO/H<sub>2</sub>, the specific activity of Pt-WO<sub>3</sub> was found to be superior to pure Pt but inferior to PtRu.

L9 ANSWER 29 OF 29 CAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1997:276395 CAPLUS  
DOCUMENT NUMBER: 126:348738  
TITLE: Electrocatalytic activity of PtRu alloy  
colloids for CO and CO/H<sub>2</sub> electrooxidation: stripping  
voltammetry and rotating disk measurements  
AUTHOR(S): Schmidt, T. J.; Noeske, M.; Gasteiger, H. A.; Behm, R.  
J.; Britz, P.; Brijoux, W.; Boennemann, H.  
CORPORATE SOURCE: Abteilung Oberflaechenchemie und Katalyse,  
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ABSTRACT:

The electrocatalytic activity of a bimetallic Pt<sub>0.5</sub>Ru<sub>0.5</sub>N(Oct<sub>4</sub>)Cl colloid toward the oxidation of CO and a CO/H<sub>2</sub> gas mixture (simulated reformer gas) was measured. The particle size distribution with a mean diameter of 1.7 ± 0.5 nm was determined by high-resolution TEM, and the formation of stoichiometrically alloyed particles was verified by point-resolved energy dispersive x-ray anal. The CO-stripping voltammetry of glassy carbon supported

Pt<sub>0.5</sub>Ru<sub>0.5</sub> clusters is in excellent agreement with CO-stripping voltammetry data measured on well-characterized bulk alloy electrodes. The activity of the colloid toward the continuous oxidation of 2% CO in H<sub>2</sub> was assessed in a rotating disk electrode configuration at 25° in 0.5 M H<sub>2</sub>SO<sub>4</sub>, leading to the conclusion that PtRu colloids are a promising route toward the preparation of bimetallic high-surface-area fuel cell catalysts.